Claims

1. (currently amended) A separator for use in alkaline zinc alkaline battery comprising

a cellulose film regenerated from a solution of cellulose, said cellulose having saturated hydrocarbon cross-links containing 4 to 16 carbon atoms, said cross-links obtained by a nucleophilic substitution reaction.

2. (original) A separator according to claim 1 in which the cross-links are attached to hydroxyl sites on the cellulose.

3. (original) A separator according to claim 2 in which 0.5% to 10% of the available hydroxyl sites contain said cross-links.

4. (currently amended) A separator according to claim 3 in which the cross-linking agent is ~~an alkylene~~ a saturated hydrocarbon chain containing 4 to 12 carbon atoms.

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5. (original) A separator according to claim 1 in which the cellulose is selected from the group consisting of microgranular cellulose, cotton fiber, paper and microcrystalline cellulose.

6. (currently amended) A zinc alkaline battery comprising in combination:

an alkali resistant battery case;

a body of alkaline electrolyte;

a zinc electrode having a portion thereof in contact with said body of electrolyte;

a counter electrode having a portion thereof in contact with said body of electrolyte; and

a cellulose separator disposed between said electrodes having no more than 10% of hydroxyl sites on cellulose chains cross-linked with a hydrocarbon group containing 4 to 16 carbon atoms via a nucleophilic substitution reaction.

7. (currently amended) A battery according to claim 6 in which the hydrocarbon group is ~~an~~ a saturated alkylene group containing 6 to 12 carbon atoms.

8. (original) A battery according to claim 7 in which the cellulose is selected from the group consisting of microcrystalline cellulose, microgranular cellulose, cotton fiber and paper.

9. (original) A battery according to claim 7 in which the counter electrode comprises silver.

10. (currently amended) A method of forming a separator for an alkaline zinc alkaline battery comprising the steps of:

dissolving cellulose in an organic solvent to form a solution;

deprotonizing from 0.5% to 10% of hydroxyl groups on the cellulose:

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adding a saturated hydrocarbon polyhalide containing 4 to 16 carbon atoms to the solution and reacting the halide atoms with the deprotonizing sites to form cross-links;

forming a film of said solution containing cross-linked cellulose; and

drying the film to form a separator.

11. (original) A method according to claim 10 in which the separator has a thickness from 10 microns to 250 microns.

12. (original) A method according to claim 11 in which the cellulose is selected from the group consisting of microgranular cellulose, cotton fiber, paper and microcrystalline cellulose.

13. (original) A method according to claim 12 in which the cellulose has a degree of polymerization from 200 to 1200.

14. (original) A method according to claim 10 in which substantially all the deprotonized sites are reacted with cross-linking agent.

15. (original) A method according to claim 10 in which the halide is an iodide.

16. (original) A method according to claim 10 in which the solvent comprises a polar aprotic solvent and an alkali metal salt.

17. (original) A method according to claim 16 in which the 3 to 8% by weight of the alkali metal salt is present based on weight of polar aprotic solvent.

18. (original) A method according to claim 17 in which the metal salt is lithium chloride and the polar aprotic solvent is DMAC.

19. (currently amended) A method according to claim 16 in which the ~~solvent~~ cellulose is present in the solution in an amount of 1 to 11% by weight.

20. (original) A method according to claim 10 in which the cellulose is deprotonized by adding an inorganic base to the solution.

21. (new) A separator according to claim 5 in which the saturated hydrocarbon chain is selected from hexyl and diododecyl.